2015-1652, -1653

United States Court of Appeals for the Federal Circuit

SOFTWARE RIGHTS ARCHIVE, LLC,

Appellant,

v.

FACEBOOK, INC., LINKEDIN CORPORATION, TWITTER, INC.,

Cross-Appellants.

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in No. IPR2013-00481

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September 25, 2015

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1. The full names of every party represented by me are LinkedIn Corporation and Twitter, Inc.

2. LinkedIn Corporation and Twitter, Inc. are the real parties in interest.

3. No parent corporations or publicly held companies own 10 percent or more of the stock of the parties represented by me.

4. The names of all law firms and the partners or associates that appeared for the party now represented by me in the trial court or agency or are expected to appear in this court are:

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Statutes, Rules and Regulations

TABLE OF ABBREVIATIONS

Parties	
Petitioners	Facebook, Inc., LinkedIn Corp., and Twitter Inc.
SRA	Software Rights Archive, LLC
Prior Art	
Fox Collection	Edward A. Fox, Characterization of Two New Experimental Collections in Computer and Information Science Containing Textual and Bibliographic Concepts, TR 83-561 (Sept. 1983) (Cornell Univ. Dept. of Comp. Science).
Fox Envision	Edward A. Fox et al., *Users, User Interfaces, and Objects: Envision, a Digital Library,* Journal of the American Society of Information Science 44, 8 (September 1993).
Fox SMART	Edward A. Fox, Some Considerations for Implementing the SMART Information Retrieval System Under UNIX, TR 83-560 (Sept. 1983) (Cornell Univ. Dept. of Comp. Science).
Fox Thesis	Edward A. Fox, Extending the Boolean and Vector Space Models of Information Retrieval with P-Norm Queries and Multiple Concept Types (Aug. 1983) (Cornell Univ. Dept. of Comp. Science).
Kambayashi	Yahiko Kambayashi et al., *Dynamic Clustering Procedures for Bibliographic Data*, Kyoto University, Department of Inf. Sci., 90-99 (1981).
Saito Clustering	Tatsuki Saito, *A Clustering Method Using the Strength of Citation*, 16 J. Inf. Sci. 175-81 (Jan. 1990).
Saito Design	Tatsuki Saito, *Design and Implementation for Scientific Article Data Base*, Bulletin of the Faculty of Eng'g, Hokkaido Univ., No. 151, pp. 19-34 (July 30, 1990).

Tapper 1976	Colin F. H. Tapper, *Citation Patterns in Legal Information Retrieval*, 3 Datenverarbeitung Im Recht 249-75 (1976).
Tapper 1982	Colin Tapper, *The Use of Citation Vectors for Legal Information Retrieval*, 1 J. of Law and Info. Sci. 131-61 (1982).

Terms

au	author subvector
bc	bibliographic coupling
Board	Patent Trial and Appeal Board
CACM	Communications of the Association of Computing Machinery
cc	co-citation
cr	*Computer Review* category subvector
did	document identifier
Egger patents	U.S. Patent Nos. 5,544,352 ("the '352 patent"), 5,832,494 ("the '494 patent"), and 6,233,571 ("the '571 patent")
IPR	*inter partes* review
IPR-478	*inter partes* review proceeding No. IPR2013-00478
IPR-479	*inter partes* review proceeding No. IPR2013-00479
IPR-480	*inter partes* review proceeding No. IPR2013-00480
IPR-481	*inter partes* review proceeding No. IPR2013-00481
IR	information retrieval
ISI	Institute for Scientific Information
ln	direct link
SMART	System for Mechanical Analysis and Retrieval of Text
tm	terms

STATEMENT OF RELATED CASES

Cross-Appellants agree with the statement of related cases provided by the Appellant. No other appeal in or from the *inter partes* review No. IPR2013-00481 has been before this or any other appellate court. This appeal is a companion case to Appeal No. 2015-1648 and Consolidated Appeal Nos. 2015-1649, 2015-1650, and 2015-1651.

Cross-Appellants add that U.S. Patent No. 6,233,571 is involved in the following three actions pending in the U.S. District Court for the Northern District of California: *Software Rights Archive LLC v. Facebook, Inc.*, No. 12-cv-3970 (N.D. Cal. July 27, 2012); *Software Rights Archive LLC v. LinkedIn Corp.*, No. 12-cv-3971 (N.D. Cal. July 27, 2012); and *Software Rights Archive LLC v. Twitter, Inc.*, No. 12-cv-3972 (N.D. Cal. July 27, 2012). Those actions are all stayed pending this appeal and its companion appeals.

JURISDICTIONAL STATEMENT

Cross-Appellants concur in the Jurisdictional Statement provided on page 2 of Appellant's Opening Brief.

I. INTRODUCTION

This is one of three related appeals of *inter partes* review decisions by the Patent Trial and Appeal Board ("Board") that found most of the challenged claims of the Egger patents[1] invalid. Those patents are directed to using indirect citation relationships between documents—for example, the fact that Document A and Document B both cite Document C—to group similar documents together and improve search and retrieval. Software Rights Archive, LLC ("SRA" or "Appellant"), the patent-assertion entity that owns the patents, argued in the IPR, as it does on appeal, that no one understood the value of these relationships for search until Egger discovered it in 1993.

But an enormous volume of evidence proved SRA wrong. Although presumably unknown to Egger—who was a law student when he allegedly conceived of his original invention—researchers in the field of information systems had understood that indirect citation relationships can aid search and

[1] The Egger patents are U.S. Patent Nos. 5,544,352 ("the '352 patent"), 5,832,494 ("the '494 patent"), and 6,233,571 ("the '571 patent"). The '494 and '571 patents are continuations-in-part of the '352 patent.

retrieval since at least the 1960s, when foundational papers on the subject were published. The Board relied on decades-old work, and expert testimony, by one of the preeminent researchers in the field, Dr. Edward A. Fox, to invalidate most of the challenged claims, although the record contains many other invalidating disclosures as well.

The Board likewise found that it was obvious by 1996 to apply these search techniques to documents stored in hypertext networks such as the World Wide Web, to which the ’571 patent—the patent at issue in this appeal—is directed. Although applying known search techniques to the Web was likely obvious as a matter of law by 1996, Dr. Fox also explicitly taught in a 1993 paper that hyperlinks between documents should be coordinated with known search methods so that citation relationships can be used to enhance searching of hypertext networks. In short, substantial evidence—indeed, abundant evidence—supported the Board’s invalidity findings, and there is no basis to disturb those findings on appeal.

The Court should, however, examine the Board’s finding that claim 21 of the ’571 patent is not obvious—the subject of Facebook, LinkedIn, and Twitter’s cross-appeal. The Board found that the prior art failed to render obvious a single claim limitation: deriving actual cluster links from the set of candidate links. But the patent specification acknowledges that this step is routine and not inventive,

calling it "a simple matter." And in finding that the prior art failed to disclose it, the Board erred by failing even to consider sections of the art that Cross-Appellants and Dr. Fox identified, which unequivocally teach this straightforward step, and by misconstruing other disclosures that also teach it. Thus, claim 21—like claims 12 and 22—contains nothing inventive, and is invalid as obvious.

II. STATEMENT OF THE ISSUES

In SRA's Appeal

1. Did the Board err in finding that claims 12 and 22 of the '571 patent are obvious over Fox Thesis, Fox SMART, and Fox Envision?

In Facebook, LinkedIn, and Twitter's Cross-Appeal

2. Did the Board err in finding that the prior art failed to render obvious the step of "deriving actual cluster links from the set of candidate cluster links" in claim 21 of the '571 patent—a step that the specification describes as "a simple matter of selecting or choosing the . . . top rated candidate links . . . and eliminating the rest"?[2]

III. STATEMENT OF THE CASE

On the petitions of Facebook, LinkedIn, and Twitter ("Petitioners" or "Cross-Appellants"), the Board instituted *inter partes* review of 28 claims of the

[2] JA05069 (23:66-24:2).

’352, ’494, and ’571 patents. The Board instituted four proceedings: IPR2013-00478 (“IPR-478”) for the ’352 claims;[3] IPR2013-00479 (“IPR-479”) for a subset of the ’494 claims that relate to searching using numerical representations of relationships between documents;[4] IPR2013-00480 (“IPR-480”) for another subset of the ’494 claims that relate to searching using clusters of related documents;[5] and IPR2013-00481 (“IPR-481”) for the ’571 claims.[6] This appeal arises from IPR-481.

In the four proceedings, the Board found 18 of the 23 challenged claims unpatentable over the prior art.[7] Specifically, the Board found that all the challenged claims in IPR-478 and IPR-479 are obvious over the prior art,[8] that one of the challenged claims in IPR-480 is anticipated by the prior art,[9] and that two of the challenged claims in IPR-481 are obvious over the prior art.[10] The Board affirmed the remaining five claims because it found that the art of record failed to

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[3] Appeal No. 15-1648 JA01207 (Inst. Dec. in IPR-478 at 25).

[4] Appeal No. 15-1649 JA01197 (Inst. Dec. in IPR-479 at 24).

[5] Appeal No. 15-1649 JA01197 (Inst. Dec. in IPR-480 at 24).

[6] JA01187 (Inst. Dec. in IPR-481 at 30).

[7] Although the Board instituted on 28 claims, it reviewed only 23 because SRA voluntarily cancelled five of its claims in IPR-480.

[8] Appeal No. 15-1648 JA00041 (Final Written Dec. in IPR-478 at 41 Appeal No. 15-1649 JA00040 (Final Written Dec. in IPR-479 at 40).

[9] Appeal No. 15-1649 JA00065 (Final Written Dec. in IPR-480 at 24).

[10] JA00035-36 (Final Written Dec. in IPR-481 at 35-36).

teach a single limitation recited in those claims—deriving actual cluster links from the set of candidate cluster links.[11]

Here, SRA appeals the Board's decision in IPR-481 finding that claims 12 and 22 of the '571 patent are obvious, and Facebook, LinkedIn, and Twitter cross-appeal the Board's decision finding that claim 21 is not obvious.

IV. STATEMENT OF THE FACTS

A. The Egger patents

The '352 patent issued to Daniel Egger in 1996 from an application filed in 1993.[12] The '494 patent issued to Egger and two co-inventors in 1998 from an application filed in 1996, which was a continuation-in-part of the application that issued as the '352 patent.[13] The '571 patent—the patent at issue in this appeal—issued to Egger and two co-inventors in 2001 from an application filed in 1998, which was a division of the CIP application that issued as the '494 patent.[14]

All three patents (the "Egger patents") purport to disclose and claim a method for searching databases such as WestLaw™ or LEXIS™ that is more efficient and accurate than traditional Boolean searches.[15] Egger—who was a law

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[11] JA00028 (Final Written Dec. at 28) Appeal No. 15-1649 JA00024 (Final Written Dec. in IPR-480 at 24).

[12] JA05305 (items [22], [45], [75]).

[13] JA05354 (items [22], [45], [63], [75]).

[14] JA05000 (items [60], [22], [45], [75]).

[15] JA05058 (1:34-45).

student when he allegedly conceived of his original invention—asserted that text-only Boolean searches have two main drawbacks.[16] First, they "only retrieve exactly what the computer interprets the attorney to have requested."[17] If the attorney doesn't phrase her request exactly as the text is represented in the database, then she won't retrieve a document, even though it may be significant to her research.[18] Second, text-only searches retrieve irrelevant documents.[19] "Since the researcher cannot possibly know all of the groupings of text within all the textual objects in the database, the researcher is unable to phrase his request to only retrieve the textual objects that are relevant."[20]

The Egger patents purport to improve upon Boolean searching by using non-semantic, indirect relationships between documents for information retrieval ("IR"). Citation relationships—e.g., Document B cites Document A—are "non-semantic" because they are not based on terms (i.e., words) common to both documents, but rather are based on one document's reference to the other.[21] Citation relationships are "indirect" when two documents are connected by a chain

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[16] JA05058 (1:46-67).

[17] JA05058 (1:47-48).

[18] JA05058 (1:48-54).

[19] JA05058 (1:54-67).

[20] JA05058 (1:63-67).

[21] *See* JA05064 (13:5-15).

of citations that passes through at least one intermediate document.[22] Figure 6 of the patents illustrates such relationships:

SCHEMATIC REPRESENTATIONS OF THE EIGHTEEN PRIMARY PATTERNS

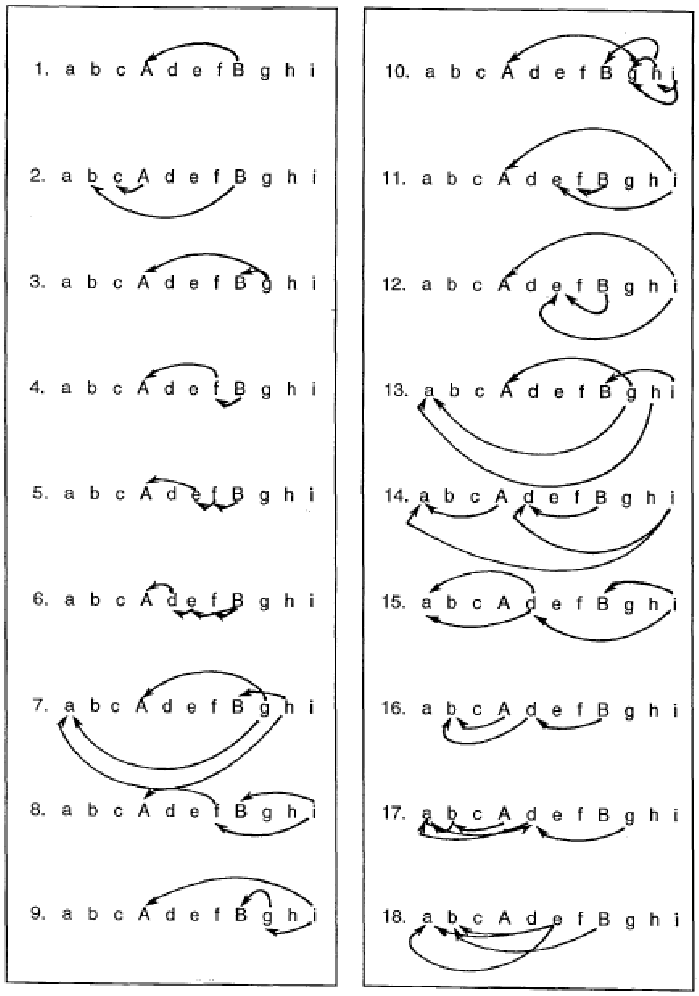

Fig. 6

Pattern 1 in Figure 6 ("B cites A") shows a *direct* citation relationship between documents A and B.[23] Pattern 2 ("A cites c, and B cites c")[24] shows an

[22] *See* JA05064 (13:29-35).

[23] JA05028.

indirect citation relationship between documents A and B known as "bibliographic coupling," often abbreviated "*bc*."[25] Pattern 3 ("g cites A, and g cites B") shows an indirect citation relationship between documents A and B known as co-citation, often abbreviated "*cc*."[26] The specification explains that these three patterns—direct citation, *bc*, and *cc*—are the most important relationships for the alleged invention.[27]

The Egger patents teach that, by using these and other relationships to calculate a "coefficient of similarity" between each document in a database and every other document in the database, the system can create "clusters" of similar documents, which can improve information retrieval.[28] Thus, for example, if a researcher is interested in *Markman v. Westview Instruments, Inc.*, the system might also present her with *Phillips v. AWH Corp.* if it determines that *Markman* and *Phillips* have a high enough coefficient of similarity.

The '571 patent, entitled "METHOD AND APPARATUS FOR INDEXING, SEARCHING AND DISPLAYING DATA," is particularly focused

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[24] Pattern 2 actually shows "A cites c, and B cites ***b***," but the specification makes clear that this is a clerical error and that it should depict B citing c. *See* JA05064 (14:35).

[25] JA05064 (14:24-36).

[26] JA05064 (14:24-36).

[27] JA05064 (14:25).

[28] JA05065, 5059 (16:13-28, 4:25-30).

on applying these methods to searches of hypertext networks like the World Wide Web ("WWW").[29] Independent claims 12 and 22 are at issue in SRA's appeal.

Claim 12 reads:

> A method for visually displaying data related to a web having identifiable web pages and Universal Resource Locators with pointers, comprising:
>
> choosing an identifiable web page;
>
> identifying Universal Resource Locators for the web pages, wherein the identified Universal Resource Locators either point to or point away from the chosen web page;
>
> analyzing Universal Resource Locators, including the identified Universal Resource Locators, wherein Universal Resource Locators ***which have an indirect relationship*** to the chosen web page are located, wherein the step of analyzing further comprises cluster analyzing the Universal Resource Locators ***for indirect relationships***; and
>
> displaying identities of web pages, wherein the located Universal Resource Locators are used to identify web pages.[30]

Thus, claim 12 recites "cluster analyzing" citations (in this case URLs) for indirect relationships, and using URLs with an indirect relationship to a chosen web page to identify other web pages that may be of interest.

Claim 22 reads:

> A method for displaying information about a network that has hyperjump data, comprising
>
> choosing a node;

[29] JA05081 (48:19-50:3); JA05083-84 (51:20-54:32); JA05058 (1:29-6:12).

[30] JA05083 (52:37-56) (emphasis added).

> accessing the hyperjump data;
>
> identifying hyperjump data from within the accessed hyperjump data that has a direct reference to the chosen node;
>
> determining hyperjump data from within the accessed hyperjump data ***that has an indirect reference to the chosen node*** by proximity indexing the identified hyperjump data; and
>
> displaying one or more determined hyperjump data, wherein the nodes are nodes in the network that may be accessed, the hyperjump data includes hyperjump links between nodes in the network, and the step of displaying comprises:
>
> generating a source map using one or more of the determined hyperjump data, wherein the source map represents hyperjump links that identify the chosen node as a destination of a link, and wherein the method further comprises activating a link represented on the source map, wherein a user may hyperjump to a node represented as a node of the link.[31]

Thus, claim 12 similarly recites determining "hyperjump data" that has an indirect reference to a chosen node (e.g., a web page[32]), and using these hyperjump data to generate a "source map" with links that a user may use to hyperjump to nodes represented on the source map.

As relevant here, the Board adopted the following constructions for terms in claims 12 and 22:

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[31] JA05058 (2:56-3:11) (emphasis added).

[32] Claim 22 uses the terminology "nodes" and "links" instead of "web pages" and "Universal Resource Locators." The patent specification explains that a "node" is "any entity that can be represented by a box on a display," such as "an object in a database, a portion of an object in a database, a document, a section of a document," or a "World Wide Web page." JA05063 (12:40-45). A "link" is "a relationship between two nodes." JA05064 (13:5-6).

“indirect relationships” and “indirect references”	“an indirect reference that is represented in data stored in a computer”[33]
“proximity indexing”	“preparing data in a database for subsequent searching by organizing and categorizing the data based on their degree of relatedness to one another”[34]
“cluster analyzing”	“identifying clusters”[35]
“web page”	“a document on the World Wide Web”[36]
“Universal Resource Locators”	“an address commonly used for a web page”[37]

Independent claim 21 is the sole claim at issue in Facebook, LinkedIn, and Twitter’s cross-appeal.

Claim 21 reads:

> A method of displaying information about a network that has hyperjump data, comprising:
>
> choosing a node;
>
> accessing the hyperjump data;
>
> identifying hyperjump data from within the accessed hyperjump data that has a direct reference to the chosen node;
>
> determining hyperjump data from within the accessed hyperjump data that has an indirect reference to the chosen node using the identified hyperjump data, wherein the step of determining comprises non-semantically generating a set of candidate

[33] JA00009 (Final Written Dec. at 9).

[34] JA00011 (Final Written Dec. at 11).

[35] JA00013 (Final Written Dec. at 13).

[36] JA00013 (Final Written Dec. at 13).

[37] JA00006 (Final Written Dec. at 6); JA01168 (Inst. Dec. at 11).

> cluster links for nodes indirectly related to the chosen node using the hyperjump data, assigning weights to the candidate cluster links and ***deriving actual cluster links from the set of candidate cluster links based on the assigned weights***; and
>
> displaying one or more determined hyperjump data.[38]

Thus, claim 21 is generally similar to claim 22, but it recites additional limitations relating to clustering and does not recite the step of generating a source map. The bolded and italicized language above is the ***only*** limitation of claim 21 that the Board found was not rendered obvious by the prior art.[39]

As relevant here, the Board adopted the following constructions for terms in claim 21:

"indirect relationships" and "indirect references"	"an indirect reference that is represented in data stored in a computer"[40]
"non-semantically"	"based on direct relationships between textual objects and that otherwise does not account for phrases and words in a textual object"[41]
"cluster links"	"relationships, which are represented in data stored in a computer and are used for grouping interrelated nodes"[42]
"candidate cluster links"	"a set of possible cluster links between a search node and a target node"[43]

[38] JA05058 (2:38-55) (emphasis added).

[39] JA00028 (Final Written Dec. at 28).

[40] JA00009 (Final Written Dec. at 9).

[41] JA00006 (Final Written Dec. at 6); JA01166 (Inst. Dec. at 9).

[42] JA00009 (Final Written Dec. at 9).

[43] JA00006 (Final Written Dec. at 6); JA01168 (Inst. Dec. at 11).

The Board further construed claim 21 as requiring that the actual cluster links be derived after the candidate cluster links are generated.[44]

B. The Prior Art

Long before Egger and his co-inventors allegedly conceived of their inventions, skilled artisans in the field of information systems understood the benefits of using non-semantic, indirect relationships between documents to improve search and retrieval, and further understood that these techniques could be applied to hypertext networks like the World Wide Web.[45] To invalidate claims 12 and 22 of the ’571 patent, the Board relied on prior-art publications and expert testimony by Dr. Edward A. Fox.[46]

As Dr. Fox explained in his Declaration, “[t]he notion of using indirect citation information to help with information systems arose by the early 1960s,” with the publication by Michael Kessler—Dr. Fox’s undergraduate thesis advisor—of “Bibliographic coupling between scientific papers” in 1963.[47] Kessler’s work on bibliographic coupling was extended by Henry Small to include co-citation as a measure of document similarity.[48] Dr. Fox’s graduate research,

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[44] JA00014 (Final Written Dec. at 14).

[45] JA05117-18, 5160 (Fox Decl. ¶¶ 36-37, 150).

[46] Dr. Fox’s background and extensive experience are summarized at JA05104-09 (Fox Decl. ¶¶ 1-14).

[47] JA05118 (Fox Decl. ¶ 37).

[48] JA05126 (Fox Decl. ¶ 57); JA06031-42 (Ex. 1016).

completed in the early 1980s, built on Kessler's and Small's work, among others'.[49]

Thus, in the Preface to his 1983 doctoral thesis, Dr. Fox explained that

> Gerald Salton, my thesis advisor, helped pioneer the development of ***automatic indexing and information retrieval systems***. M.M. Kessler, my undergraduate thesis advisor, developed the notion of ***bibliographic coupling between documents***, which was later extended by Henry Small to make use of ***co-citations as a measure of similarity***. Harry Wu proposed the p-norm model as a generalization of the Boolean and vector space models of information retrieval.
>
> ***This thesis is an attempt to integrate these contributions into a workable framework that can be of practical value to users of future information retrieval systems***.[50]

Consistent with this purpose, in his doctoral research, Dr. Fox integrated (1) an automated (i.e., computerized) information retrieval system, with (2) measurements of similarity between documents based on bibliographic coupling and co-citation, along other with other information retrieval techniques.[51]

The automated retrieval system that Dr. Fox used for this research was called SMART, which stands for "System for Mechanical Analysis and Retrieval of Text."[52] Dr. Fox designed and led the implementation of a new version of

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[49] JA05126 (Fox Decl. ¶ 57).

[50] JA05528 (Fox Thesis Preface) (emphasis added).

[51] JA05119 (Fox Decl. ¶¶ 40).

[52] JA05119 (Fox Decl. ¶¶ 40).

SMART, written in the C language under UNIX.[53] He then created two test collections to test his methods and algorithms: the "CACM collection," which included publications by the Association for Computing Machinery, one of the leading organizations promoting scholarly activities relating to computing; and the "ISI collection," which included citation indexing information published by the Institute for Scientific Information (now part of Thomson-Reuters).[54]

Dr. Fox's research culminated in a 1,000-page dissertation, which—at the urging of his graduate advisors—he divided into three papers, all published in 1983:[55]

- ["Fox Thesis"] Edward A. Fox, Extending the Boolean and Vector Space Models of Information Retrieval with P-Norm Queries and Multiple Concept Types (Aug. 1983) (Cornell Univ. Dept. of Comp. Science);[56]
- ["Fox Collection"] Edward A. Fox, Characterization of Two New Experimental Collections in Computer and Information Science

[53] JA05119-20 (Fox Decl. ¶ 42).

[54] JA05121.

[55] JA05119-20, 5161-62 (Fox Decl. ¶¶ 42, 154).

[56] JA05518-5907 (Fox Thesis, Ex. 1012).

Containing Textual and Bibliographic Concepts, TR 83-561 (Sept. 1983) (Cornell Univ. Dept. of Comp. Science);[57]

- ["Fox SMART"] Edward A. Fox, Some Considerations for Implementing the SMART Information Retrieval System Under UNIX, TR 83-560 (Sept. 1983) (Cornell Univ. Dept. of Comp. Science).[58]

Thus, Fox Thesis, Fox Collection, and Fox SMART were written by the same author, describe the same research, and were originally a single work. Each paper also refers to the other two multiple times.[59]

After publishing these three papers, Dr. Fox continued his research, including research directed to hypertext networks, which became popular by the early 1990s.[60] In 1993, Dr. Fox and co-authors published another paper that the Board relied on, which described research they conducted on a system called Envision:

- ["Fox Envision"] Edward A. Fox et al., *Users, User Interfaces, and Objects: Envision, a Digital Library,* Journal of the American Society of Information Science 44, 8 (September 1993), 480-491.[61]

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[57] Appeal No. 15-1649 JA05197-5263 (Fox Collection, IPR-479 Ex. 1206).

[58] JA05908-6000 (Fox SMART, Ex. 1013).

[59] *See, e.g.*, JA05884 (Fox Thesis at 343); JA05995 (Fox SMART at 84).

[60] JA05121-25 (Fox Decl. ¶¶ 44-52).

[61] JA05447-58.

Fox Thesis, Fox SMART, and Fox Envision are described in more detail below.

1. Fox Thesis

Fox Thesis identified the same problems with term-only Boolean searches that the Egger patents identified a decade later.[62] To overcome these problems, Fox Thesis described methods of clustering documents based on concepts (also called "vectors" or "subvectors") in addition to, or in place of, terms.[63] According to Fox Thesis, clustering similar documents in a database improves search and retrieval because "closely associated documents tend to be relevant to the same requests."[64] In other words, with clustering, a query will retrieve not only "documents whose terms match its terms," but also "documents which have little in common with the query terms but are highly correlated though other components of the extended vectors"—such as bibliographic relationships—"with already retrieved items in the clusters."[65]

In Fox Thesis, vectors of particular interest for clustering included "bibliographic information such as direct references between documents and other derived measures such as those of bibliographic coupling and co-citation

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[62] *Compare* JA05058 (1:46-2:13) *with* JA05551 (Fox Thesis at 10).

[63] JA05694-5723 (Fox Thesis at 153-82).

[64] JA05724 (Fox Thesis at 183).

[65] JA05724 (Fox Thesis at 183).

strength."[66] Fox Thesis explained that, given a set of documents that reference each other, a computer can measure the strength of each bibliographic relationship by counting the number of times each document is linked—whether through direct citation, bibliographic coupling or co-citation—with every other document, and assigning weights to those links.[67] The computer can then construct submatrices (or tables) to represent the values of those linkages.[68]

After describing how to compute the similarity between database objects using direct and indirect references, Fox Thesis described an algorithm for clustering documents based on those similarity values.[69] For each new document, the clustering algorithm searches for the proper cluster in the tree in which to insert the new document.[70] Then, the algorithm adjusts the tree so that all of the clusters "conform to the various constraints" imposed.[71] In particular, the algorithm may continually "split" and reform the clusters so that "the tree stays relatively balanced and all documents are the same distance from the root."[72]

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[66] JA05700 (Fox Thesis at 159).

[67] JA05708-10 (Fox Thesis at 167-69).

[68] JA05710-14 (Fox Thesis at 169-73).

[69] JA05724-35, 5754-72 (Fox Thesis at 183-94, 213-31).

[70] JA05734 (Fox Thesis at 193).

[71] JA05734, 5740-41 (Fox Thesis at 193, 199-200).

[72] JA05734 (Fox Thesis at 193).

A central teaching of Fox Thesis is that using extended vectors including bibliographic coupling (*bc*) and co-citation (*cc*) to cluster similar documents can improve search and retrieval.[73] SRA cherry-picks a few quotations to argue otherwise, but it ignores many others. For example, describing the results of one test, Fox Thesis explained that

> *bc* gave rather poor results but ***the* bc-cc *combination seemed rather good***. **tm *[terms] did not do especially well***, perhaps because many of the term connections are due to high frequency term matches, which convey little information. *cc* and *ln* [direct citation link] subvectors seemed to yield comparable results, each somewhat better than *bc*. ***A mixture of all types* (mx) *was not as productive of good clusters as was the simpler* bc-cc *combination*** . . . .[74]

Similarly, describing another test, Fox Thesis stated that "***Overall, the best behavior seemed to come when* bc *and* cc *were combined with equal weighting***."[75] And describing another, it stated that "[o]f all subvectors, terms are best, though co-citations are not much worse. . . . Using regression or guessed at coefficients, ***the* tm *and* cc *combination yields a 5-6% improvement over the performance when terms are used alone***,"[76] leading to the conclusion that "***apparently the best combination is to use* tm *and* cc.**"[77] Fox Thesis also reported

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[73] *See* JA05127-29 (Fox Decl. ¶¶ 60-67).

[74] JA05758 (Fox Thesis at 217) (emphasis added).

[75] JA05810 (Fox Thesis at 269) (emphasis added).

[76] JA05788 (Fox Thesis at 247) (emphasis added).

[77] JA05787 (Fox Thesis at 246) (emphases added).

results showing up to a 12.1% improvement over terms alone when indirect subvectors were used.[78]

2. Fox SMART

Fox SMART described how Dr. Fox implemented the ideas discussed in Fox Thesis on a new version of SMART.[79] That implementation of SMART included a database that stored the CACM and ISI collections, along with other information.[80] An "automatic indexing component construct[ed] stored representations of documents," and then a "search component select[ed] those documents which seem most similar to a user's query."[81]

Like Fox Thesis, Fox SMART described a method for improving terms-only Boolean search and retrieval by clustering documents based on bibliographic relationships.[82]

Fox SMART began its discussion of clustering by describing algorithms for generating submatrices to represent the bibliographic relationships between

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[78] JA05793 (Fox Thesis at 252); *see also, e.g.*, JA05789 (Fox Thesis at 248) ("***As hoped, co-citations are reasonably useful***"), and JA05812 (Fox Thesis at 271) ("***for ISI, terms and co-citations seemed most valuable***") (all emphases added).

[79] JA05908-14 (Fox SMART at cover page to 3).

[80] JA05923-24 (Fox SMART at 12-13).

[81] JA05914 (Fox SMART at 3).

[82] JA05938-65 (Fox SMART at 27-54).

documents, including indirect relationships (*bc* and *cc*).[83] The algorithm first processes the "basic raw data" of the document collection by analyzing "which documents are cited by others."[84] This direct citation data can be represented as "tuples" (pairs), or it can be represented as a submatrix showing the *ln* (link—i.e., direct citation) subvector.[85] The algorithm next forms the submatrices for the *bc* and *cc* subvectors.[86] Thus, Fox SMART described an algorithm that analyzes direct references, then identifies and assigns weights to indirect references, all of which can be represented as subvectors in tables or submatrices.[87]

Following its discussion of the formation of submatrices to represent the bibliographic connections between documents, Fox SMART described an algorithm for clustering and searching documents based on similarity.[88] As Fox SMART explained, "[c]lustering is simply a process for creating groupings, and clustered searching allows retrieval of groups in response to query submission."[89] The clustering algorithm described in Fox SMART was practically identical to the

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[83] JA05940 (Fox SMART at 29).

[84] JA05940-41 (Fox SMART at 29-30).

[85] JA05941 (Fox SMART at 30).

[86] JA05941-43 (Fox SMART at 30-32).

[87] JA05940-43 (Fox SMART at 29-32).

[88] JA05952-66 (Fox SMART at 41-51).

[89] JA05953 (Fox SMART at 42).

algorithm described in Fox Thesis.[90] Documents were clustered based on their "overall similarity," which was determined based on "available subvectors," including indirect bibliographic relationships like *bc* and *cc*.[91] These available subvectors were used to compute the "similarity coefficient" and "overall similarity" between each document in the database and every other document in the database.[92] The algorithm then formed clusters containing documents that were closely related.[93]

Like Fox Thesis, Fox SMART taught that using "extended vectors" including *bc* and *cc* can improve search and retrieval, explaining that "[o]ne motivation for the [extended vector] model was the ***success of clustering studies considering bibliographic data instead of or in addition to terms***," and directing the reader to Fox Thesis for more details.[94]

3. Fox Envision

Published in 1993—ten years after Fox Thesis and Fox SMART—Fox Envision discussed a research effort called "Project Envision," which sought to

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[90] JA05954-57 (Fox SMART at 43-46); JA05734-35 (Fox Thesis at 193-94).

[91] JA05957 (Fox SMART at 46).

[92] JA05957 (Fox SMART at 46).

[93] JA05957 (Fox SMART at 46).

[94] JA05954 (Fox SMART at 43) (emphasis added).

build a "user-centered database" of computer science literature.[95] The paper was particularly concerned with "solv[ing] important research problems relating to digital libraries, especially those relating to information storage and retrieval, human-computer interaction, and electronic publishing."[96] Among other things, it proposed an "innovative Envision user interface design."[97] It also "aimed to harmonize and integrate concepts from a variety of interrelated fields," including "hypertext[,] hypermedia[,]" and "information storage and retrieval."[98]

Fox Envision identified as a fundamental principle for future "digital libraries" that "[l]inks [between documents] should be recorded, preserved, organized, and generalized."[99] It explained that

> [a]s we integrate documents into very large collections covering an entire scientific domain or professional area, ***links among those documents become increasingly important to help with search*** and browsing. Groupings of those links into paths, threads, tours, and webs are essential for organizing, personalizing, sharing, and preserving the structural, interpretational, and evolutionary connections that develop. We are beginning to see the emergence of wide area hypertext systems like the WorldWideWeb (WWW), that carry this concept forward into a distributed environment. ***Clearly, we must coordinate hypertext and hypermedia linking with the various approaches to search and retrieval***. One approach is the idea of information graphs (including hypergraphs), where objects of all types

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[95] JA05447 (Fox Envision at 480).

[96] JA05447 (Fox Envision at 480).

[97] JA05447, 5451-57 (Fox Envision at 480, 484-90).

[98] JA05448 (Fox Envision at 481).

[99] JA05449 (Fox Envision at 482) (italics omitted).

> are interrelated by links or arcs ***that capture not only citation (reference)*** but also inheritance, inclusion, association, synchronization, sequencing, and other relationships.[100]

Fox Envision further taught that "advanced retrieval methods can be more effective [than] conventional Boolean approaches," that "users prefer vector and feedback methods to standard Boolean searching," and that "future digital libraries should certainly be designed to use the most advanced retrieval methods possible."[101]

C. Proceedings Below

After considering the arguments and evidence submitted by the parties, the Board concluded in IPR-481 that one of ordinary skill in the art would have combined the teachings of Fox Thesis and Fox SMART with the teachings of Fox Envision.[102] The Board then found that claims 12 and 22 were unpatentable under § 103 over the combination of Fox Thesis, Fox SMART, and Fox Envision.[103] In particular, the Board found that Fox Thesis and Fox SMART both taught each of the steps of claim 12[104] and claim 22[105] apart from the hypertext limitations, and

[100] JA05449 (Fox Envision at 482) (emphases added and citations omitted).

[101] JA05449 (Fox Envision at 482).

[102] JA00018-19 (Final Written Dec. at 18-19).

[103] JA00025, 31 (Final Written Dec. at 25, 31).

[104] JA00017-18, 21-22 (Final Written Dec. at 17-18, 21-22)

[105] JA00029-31 (Final Written Dec. at 29-31).

that Fox Envision explicitly taught applying those teachings to hyperlinks and the World Wide Web.[106]

The Board also rejected SRA's contention that objective or secondary considerations overcame the showing of obviousness. SRA rested its secondary-considerations case on Google's PageRank algorithm.[107] To support its contention that "Google's search engine using its PageRank algorithm is a commercial embodiment of the invention claimed in the challenged claims of the '571 Patent,"[108] SRA relied on the opinion of Dr. Amy Langville, its retained expert. In deposition, however, Dr. Langville admitted that she did not review or rely upon source code for Google's search algorithm in preparing her opinions.[109] Instead, she relied on the disclosure of a PageRank algorithm in a single patent—U.S. Patent No. 6,258,999—and other public sources,[110] even though the record showed that most of Google's PageRank algorithm was protected as a trade secret, and therefore was not disclosed in any of those sources.[111] Dr. Langville also failed to consider at least nine other patents issued to Larry Page concerning PageRank, or

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[106] JA00018-19, -22, -31 (Final Written Dec. at 18-19, -22, -31).

[107] JA01300-04 (Patent Owner Resp. at 55-59).

[108] JA01300 (Patent Owner Resp. at 55).

[109] JA06669 (Langville Dep. Tr. 133:1-17).

[110] JA06619, 06673 (Langville Dep. Tr. 82:15-25; 137:5-21).

[111] JA11344 (Ex. 2055 at 10 ("Most of our current ranking technology is protected as trade secret.").

whether, and how much, the inventions claimed in Google's many PageRank patents contributed to Google's success.[112] Similarly, Dr. Langville failed to consider other licenses that Google and other search companies have entered into, or whether, and how much, the technology covered by those licenses contributed to those companies' success.[113]

The Board carefully considered SRA's proffered evidence of secondary considerations and rejected it in each of the four related IPRs.[114] First, the Board ruled that SRA failed to provide evidence of a nexus between Google's technology and the asserted claims.[115] "Because Patent Owner has failed to provide the source code of PageRank, or any other detailed information beyond publicly-available, generalized hearsay statements about Google's search, the record is insufficient to prove that PageRank uses" the technology of the asserted claims.[116] Next, the Board concluded that—based on SRA's own expert testimony—Google's primary "insight" rested on an analysis of direct links, not indirect relationships, which is

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[112]JA06138-6269 (Exs. 1021-31, Langville Dep. Tr. 81:5-11, 82:2-5, 137).

[113] JA06674-77 (Langville Depo. 138-141,140:21-141:4).

[114] SRA made redundant arguments in the four IPRs. Thus, the Board provided a fulsome discussion of some of SRA's arguments in certain decisions and a more abbreviated discussion of those arguments in others.

[115] JA00024 (Final Written Dec. at 24).

[116] JA00022 (Final Written Dec. in IPR-479 at 22).

the allegedly novel feature of the '571 Patent.[117] The Board also observed that Google's and other search companies' licenses with SRA were entered into to settle litigation.[118] For these reasons, the Board concluded that SRA's "weak showing of secondary considerations" could not overcome Facebook, LinkedIn, and Twitter's "strong case of obviousness" for claims 12 and 22.[119]

With respect to claim 21, however, the Board found that the clustering algorithm disclosed in Fox SMART and Fox Thesis failed to render obvious a single claim limitation: the step of "deriving actual cluster links from the candidate cluster links."[120] In the Board's view, the fully formed cluster tree was the set of candidate cluster links.[121] But because the clustering algorithm does not delete documents from the cluster tree, the Board concluded that the algorithm fails to derive a subset of actual cluster links from the candidate cluster links.[122] Based on this conclusion, the Board upheld the patentability of claim 21.

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[117] JA00024 (Final Written Dec. at 24).

[118] JA00024 (Final Written Dec. at 24).

[119] JA00024 (Final Written Dec. at 24).

[120] JA00028 (Final Written Dec. at 28).

[121] JA00025-26 (Final Written Dec. at 25-26).

[122] JA00026-28 (Final Written Dec. at 26-28).

V. SUMMARY OF THE ARGUMENT

The Board properly found that claims 12 and 22 of the ’571 patent are unpatentable under 35 U.S.C. § 103 because they are obvious over the combination of Fox Thesis, Fox SMART, and Fox Envision. A person of ordinary skill in the art would have combined the teachings of Fox Thesis, Fox SMART and Fox Envision because (1) they were authored by the same person, (2) Fox Envision was a follow-on work to Fox Thesis and Fox SMART, and (3) all three papers were trying to solve the same problem in the same field. Furthermore, Fox Envision explicitly taught that known techniques for search and retrieval—and, in particular, techniques based upon links between documents—should be applied to hypertext networks such as the World Wide Web.

The Board also properly rejected SRA’s attempts to overcome Petitioners’ strong showing of obviousness. Contrary to what SRA contends, Fox Thesis and Fox SMART did not “teach away” from using indirect relationships. On the contrary, one of the central teachings of Fox Thesis and Fox SMART was that using indirect citation relationships like *bc* and *cc* to cluster similar documents can improve search and retrieval. And the Board properly accorded little weight to SRA’s proffered evidence of secondary considerations because SRA failed to establish a nexus between that evidence and the purportedly novel features of its claimed invention, and its proffered evidence was insufficient to overcome

Petitioners' strong showing of obviousness. Thus, the Board's decision with respect to claims 12 and 22 should be affirmed.

As to claim 21, however, the Board erred. First, the Board failed even to consider whether Fox SMART's cluster-splitting process disclosed the "deriving" limitation, even though Petitioners and Dr. Fox identified cluster splitting as disclosing that limitation. Fox SMART taught that cluster splitting occurs continually when clusters exceed a pre-determined size (e.g., 20 documents). To create new clusters from the documents that previously formed the split cluster, the algorithm first calculates a "pairwise similarity value" between each document and every other document, using, among other things, indirect bibliographic relationships (*bc* and *cc*) to calculate similarity. Each of these similarity values is a "candidate cluster link" to a document that is indirectly related to the chosen document, with a weight assigned to that link. The algorithm then derives clusters—i.e., "actual cluster links"—based on similarity values that exceed a pre-determined threshold; these actual cluster links, by definition, are a subset of the set of candidate links. Thus, cluster splitting discloses the "deriving" limitation of claim 21—but the Board never considered cluster splitting in its decision.

Second, even if one looked only at cluster-tree formation and ignored cluster splitting, as the Board did, the "deriving" limitation is still disclosed. The Board misunderstood how Fox Thesis and Fox SMART's cluster-tree formation operates,

leading it to erroneously conclude that Fox Thesis and Fox SMART failed to render obvious the straightforward and non-inventive step of deriving actual cluster links from candidate links. Because of these two errors, the Board's decision with respect to claim 21 should be reversed, and the Court should hold that claim 21, too, is obvious.

VI. ARGUMENT

"A claimed invention is unpatentable if the differences between it and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the pertinent art." *In re Kahn*, 441 F.3d 977, 985 (Fed. Cir. 2006); 35 U.S.C. § 103(a). "The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007). Thus, this Court has repeatedly held that claims applying known methods to Internet technology—including hyperlinks and URLs—were obvious by the early 1990s. *See, e.g.*, *Soverain Software LLC v. Newegg Inc.*, 705 F.3d 1333, 1344 (Fed. Cir. 2013); *Western Union Co. v. MoneyGram Payment Syst., Inc.*, 626 F.3d 1361, 1370-71 (Fed. Cir. 2010); *Muniauction, Inc. v. Thomson Corp.*, 532 F.3d 1318, 1326-28 (Fed. Cir. 2008).

The Board's ultimate legal conclusion regarding obviousness is reviewed *de novo*, while its underlying factual findings are reviewed for substantial evidence.

In re Gartside, 203 F.3d 1305, 1316 (Fed. Cir. 2000). "[T]he 'substantial evidence' standard asks whether a reasonable fact finder could have arrived at the [Board's] decision." *Id.* at 1312. "[T]he possibility of drawing two inconsistent conclusions from the evidence does not prevent [the Board's] finding from being supported by substantial evidence." *Id.* (citation and quotation marks omitted). Indeed, the Board's "decision to favor one conclusion over the other is the epitome of a decision that must be sustained upon review for substantial evidence." *In re Jolley*, 308 F.3d 1317, 1329 (Fed. Cir. 2000).

A. Substantial evidence supports the Board's finding that claims 12 and 22 of the '571 patent are obvious in light of Fox Thesis, Fox SMART, and Fox Envision.

1. A person of ordinary skill would have combined the teachings of Fox Thesis, Fox SMART, and Fox Envision.

SRA does not seriously dispute the Board's finding that a skilled artisan would have combined the teachings of Fox Thesis and Fox SMART with Fox Envision, and for good reason.[123] In Fox Envision, Dr. Fox taught that known methods of search and retrieval—and, in particular, methods that used links between documents—should be applied to hypertext networks such as the World Wide Web. Fox Envision stated:

> *Principle 3: Links should be recorded, preserved, organized, and generalized.*

[123] *See* Br. at 34-63.

> As we integrate documents into very large document collections covering an entire scientific domain or professional area, ***links among those documents become increasingly important to help with search*** and browsing. Groupings of those links into paths, threads, tours, and webs are essential for organizing, personalizing, sharing, and preserving the structural, interpretational, and evolutionary connections that develop. We are beginning to see the emergence of wide area hypertext systems (Yankelovich, 1990) like the WorldWideWeb (WWW), that carry this concept forward into a distributed environment. ***Clearly, we must coordinate hypertext and hypermedia linking with the various approaches to search and retrieval*** (Fox et al., 1991b). One approach is the idea of information graphs (including hypergraphs), where objects of all types are interrelated by links or arcs ***that capture not only citation (reference)*** but also inheritance, inclusion, association, synchronization, sequencing, and other relationships.[124]

For at least three reasons, one of skill in the art would have understood "various approaches to search and retrieval" to include the approaches disclosed in Fox Thesis and Fox SMART.

First, the context of this statement is a passage arguing that links between documents should be preserved and used. The passage explained that, as the size of document collections grows, "links among . . . documents become increasingly important to help with search[.]" And it further explained that one way to implement the coordination of hyperlinks with known information retrieval methods is to create information graphs that capture citation relationships, along with other information. Thus, Fox Envision taught that citation links between documents (in this case hyperlinks) should be used to help with search in hypertext

[124] JA05449 (Fox Envision 482) (emphasis added and citations omitted).

networks—just as Fox SMART and Fox Envision taught that citation links helped with search in other document collections.

Second, Fox Thesis, Fox SMART, and Fox Envision share the same primary author, and Fox Envision was a continuation of the same research activities that produced Fox Thesis and Fox SMART.[125]

Third, all three papers were trying to solve the same problem in the same field—improving information discovery and retrieval in automated retrieval systems.[126]

Thus, the Board's finding that a skilled artisan would combine the teachings of Fox Thesis, Fox SMART, and Fox Envision is supported by substantial evidence. *See KSR*, 550 U.S. at 418.[127]

2. Substantial evidence proved that the combination of Fox Thesis, Fox SMART, and Fox Envision renders claims 12 and 22 obvious.

SRA argues that, even when combined, these three papers do not teach that the citation analysis of Fox Thesis and Fox SMART should be applied to

[125] JA05119-25, 5161-62 (Fox Decl. ¶¶ 42-52, 154-55).

[126] JA05119-25, 5161-62, 5186-88 (Fox Decl. ¶¶ 42-52, 154-55, 224-30).

[127] Furthermore, as Dr. Fox testified—and as this Court has recognized—applying known methods of information retrieval to Web technology would have been obvious by 1996, even without Fox Envision's explicit suggestion to combine. JA05186 (Fox Decl. ¶ 223); *see Soverain*, 705 F.3d at 1344; *Western Union*, 626 F.3d at 1370-71; *Muniauction*, 532 F.3d at 1326-28.

hyperlinks and URLs.[128] In particular, SRA argues that "[n]one of the Fox Papers suggest[s] analyzing hyperlink relationships on the World Wide Web or other networks."[129] But this argument erroneously analyzes each reference in isolation, not in combination, and ignores Fox Envision's explicit teachings.

SRA first contends that because Fox Thesis and Fox SMART predated widespread use of web-based hyperlinks, their teachings are limited to "bibliographic citations" between paper documents in the CACM collection.[130] Similarly, SRA contends that Fox Thesis taught only the use of document identifiers ("dids"), not URLs,[131] and that Fox Envision did not explicitly mention the use of indirect relationships expressed as hyperlinks.[132]

These contentions all fail because they improperly attack the prior-art references in isolation, ignoring what they teach in combination. "Non-obviousness cannot be established by attacking references individually where the [obviousness challenge] is based upon the teachings of a combination of references." *In re Merck & Co.*, 800 F.2d 1091, 1097-98 (Fed. Cir. 1986). Fox

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[128] Br. at 34-41. By failing to raise other arguments specific to claims 12 and 22, SRA has waived them. *See Abbott Labs. v. Syntron Bioresearch, Inc.*, 334 F.3d 1343, 1355 (Fed. Cir. 2003) (holding that a party waives an argument by failing to raise it in the opening brief).

[129] *Id.* at 34.

[130] Br. at 34-35.

[131] Br. at 39-41.

[132] Br. at 36.

Thesis and Fox SMART taught that indirect citation relationships such as *bc* and *cc* are valuable for improving search and retrieval. A decade later, Fox Envision taught that, as the size of collections grows, "links among . . . documents become increasingly important to help with search"; that "[c]learly, we must coordinate hypertext and hypermedia linking with the various approaches to search and retrieval"; and that one approach for doing so is the creation of information graphs that capture "citation (reference)," along with other information.[133] The Board therefore had ample evidence to find that "cordinat[ing] hypertext and hypermedia linking with the various approaches to search and retrieval" disclosed the use of hyperlink citations, including the known value of indirect citations, for search.

SRA next points to the purported "source code" for the Envision system.[134] But even if the non-public source code were relevant in the IPR proceedings (which it is not),[135] it would only support the Board's finding, not undermine it. SRA's expert, Dr. Jacobs, acknowledged that the "source code" shows that the CACM files that were loaded into the Envision system included *bc* and *cc* subvectors.[136] Dr. Jacobs protested only that the CACM documents did not

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[133] JA05449 (Fox Envision 482).

[134] Br. at 37-38.

[135] *See* 35 U.S.C. § 311(b).

[136] Br. at 37-39.

contain hyperlinks to one another.[137] But Fox Envision stated that "hypermedia capabilities" were then (in 1993) "under design" in the Envision system.[138] Thus, the Fox Envision printed publication—which is the art relevant to this proceeding—disclosed hyperlinks between the documents stored in Envision, even if those links had not yet been encoded in the source code. To the extent the source code matters at all, it confirms the Board's findings by showing that Dr. Fox used *bc* and *cc* subvectors in the actual Envision system.

Unable to escape Fox Envision's teachings, SRA misreads the text.[139] SRA argues that Fox Envision's exhortation to "coordinate hypertext and hypermedia linking with the various approaches to search and retrieval" *could* be interpreted to mean that hypertext links are used solely for navigation, and not as citations for purposes of clustering and search.[140] But this interpretation—which would reduce the statement to a self-evident truism, since hypertext links are used for navigation by definition—ignores Fox Envision's language.

The text states that hypertext and hypermedia linking should be coordinated with "the various approaches for search and retrieval"—not just used for

[137] Br. at 37, 38-39 (citing JA12349).

[138] JA05455 (Fox Envision at 488)

[139] *See* Br. at 35-37, 38-39.

[140] Br. at 36-37.

browsing.[141] Moreover, several sentences earlier, Fox Envision states that, as the size of document collections grows, "links among . . . documents become increasingly important to help with search ***and*** browsing."[142] And the sentence following the statement in question states that "one approach" for coordinating hypertext and hypermedia linking with known approaches for search and retrieval is an information graph where "objects of all types are interrelated by links or arcs that capture not only ***citation (reference)*** but also inheritance, inclusion, association, synchronization, sequencing, and other relationships"—clearly teaching that relationships between documents, including citation relationships, are to be used for analytical purposes to improve search and retrieval, not just for navigation.[143]

In sum, substantial evidence supports the Board's finding that the combined teachings of Fox Thesis, Fox SMART, and Fox Envision teach the application of indirect citation analysis to hyperlinks and the Web. SRA's arguments to the contrary fail because they improperly attack references in isolation, focus on irrelevant facts, and misread Fox Envision's language.

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[141] JA05449 (Fox Envision at 482).

[142] JA05449 (Fox Envision at 482) (emphasis added).

[143] JA05449 (Fox Envision at 482) (emphasis added).

B. Substantial evidence supports the Board's rejection of SRA's "teaching away" argument.

A reference teaches away from a claimed invention only when a person of ordinary skill, "upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994). But "[t]he degree of teaching away will of course depend on the particular facts." *Id*. Additionally, just because "better alternatives" may exist in the prior art "does not mean that an inferior combination is inapt for obviousness purposes." *In re Mouttet*, 686 F.3d 1322, 1334 (Fed. Cir. 2012) (citing *Gurley*, 27 F.3d at 553).

SRA relies on cherry-picked quotations from the lengthy Fox Papers to argue that they teach away from using indirect relationships such as *bc* and *cc* for search.[144] But SRA ignores the extensive teachings in the same publications that advocate the use of *bc* and *cc* for search. For example, Fox Thesis described test results that showed that "*bc* gave rather poor results but ***the* bc-cc *combination seemed rather good*** . . . ."[145] Describing another test, it taught that "***the best behavior seemed to come when bc and cc were combined with equal***

[144] SRA Br. at 41-50.

[145] JA05758 (Fox Thesis at 217) (emphasis added).

weighting."[146] Using regression coefficients (different weights for different subvectors), Fox Thesis taught that "***the* tm *and* cc *combination yields a 5-6% improvement over the performance when terms are used alone***,"[147] leading to the conclusion that "***apparently the best combination is to use* tm *and* cc.**"[148] Describing other tests, Fox Thesis stated that "***[a]s hoped, co-citations are reasonably useful***,"[149] and that "***for ISI, terms and co-citations seemed most valuable***."[150] Fox Thesis also reported results showing up to a 12.1% improvement over terms alone when indirect subvectors were used.[151]

Describing a technique as "rather good," producing "the best behavior," part of "the best combination," "useful," "most valuable," and yielding significant improvements does not teach away from that technique. As Dr. Fox explained, even if certain isolated experiments showed that a particular subvector was less useful than others under certain conditions and using certain data sets, skilled artisans would understand from Fox Thesis and Fox SMART that indirect subvectors were valuable under many conditions and with many data sets.[152]

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[146] JA05810 (Fox Thesis at 269) (emphasis added).
[147] JA05788 (Fox Thesis at 247) (emphasis added).
[148] JA05787 (Fox Thesis at 246) (emphases added).
[149] JA05789 (Fox Thesis at 248) (emphases added).
[150] JA05812 (Fox Thesis at 271) (emphases added).
[151] JA05793 (Fox Thesis at 252).
[152] *See* JA06491-6500 (Fox Reply Decl. ¶¶ 375-89).

SRA also mischaracterizes a quotation from a 1986 paper by Gerard Salton that "the citation methodology cannot be recommended for inclusion in practical retrieval environments."[153] SRA misleadingly suggests that Salton was discouraging the use of indirect relationships such as *bc* and *cc* for search. In fact, Salton was describing an entirely different technique—the inclusion of *words from the title* of one document in a searchable index for a second document if the two documents are bibliographically related.[154] That is not what Dr. Fox did, nor what the Egger patents claim.

Similarly, SRA mischaracterizes or ignores other prior art of record. SRA exhorts the Court to evaluate "the prior art as a whole," by which it apparently means references other than Fox Thesis, Fox SMART, and Fox Envision.[155] But the additional art of record demonstrates a common and pervasive understanding among skilled artisans that indirect citation relationships can aid search and retrieval. For example, two papers by Colin Tapper published in 1976 and 1982 taught the use of indirect citation relationships for searching databases of *legal cases*—exactly as Egger described over a decade later.[156] Tapper taught to create "citation vectors" for legal cases that included both the cases that each case cited

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[153] *See, e.g.*, SRA Br. at 18-19, 47-48, 50.

[154] JA10859-60 (Exhibit 2026).

[155] *See* SRA Br. at 43-46.

[156] *See* JA06043-76 (Tapper 1982), JA06077-6105 (Tapper 1976).

and the cases that each case was cited by.[157] The vectors were then compared, and an algorithm was applied to calculate the similarity between cases based on their overlapping citations.[158] Cases with "a high degree of association" were then clustered, enabling retrieval of clusters rather than individual cases.[159] After extensive testing at Stanford, Tapper concluded that "the idea of using citation vectors seems to have much to commend it," and that "[e]nough research has been done on the technique to show that it can be made to work."[160]

Similarly, Tatsuki Saito published two papers in 1990—one titled "A clustering method using the strength of citation," and the other titled "Design and Implementation for Scientific Article Data Base"—which described analyzing a direct-citation matrix for indirect relationships (i.e., indirect citations), and forming a similarity matrix to be used for cluster searching.[161] Yahiko Kambayashi published a paper in 1981 titled "Dynamic Clustering Procedures for Bibliographic Data," which described using direct citation, bibliographic coupling, and co-

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[157] JA06055 (Tapper 1982 at 140).

[158] JA06057 (Tapper 1982 at 142) ("The second technique was to recognise that even a small area of common citation indicates that two cases have an area of common concern, and ought to be relatively closely correlated as a result on that point even though they may have nothing else in common.")

[159] JA06058-60 (Tapper 1982 at 143-145).

[160] JA06076 (Tapper 1982 at 161).

[161] Appeal No. 15-1648 JA05723 (Saito Design at 20).

citation as "similarity measure[s]" for clustering.[162] Even Dr. Jacobs—SRA's litigation expert—published a book in 1992 that included a paper teaching that indirect citation relationships are useful for search.[163]

In sum, the prior art of record, including Dr. Fox's work and others', amply teaches and motivates the use of indirect citation relationships in searching. Substantial evidence therefore supports the Board's rejection of SRA's teaching away arguments. *See Mouttet*, 686 F. 3d at 1330-31.

C. The Board properly found that SRA failed to present sufficient evidence of nonobviousness.

"For objective evidence [of nonobviousness] to be accorded substantial weight, its proponent must establish a nexus between the evidence and the merits of the claimed invention." *In re GPAC Inc.*, 57 F.3d 1573, 1580 (Fed. Cir. 1995). "Where the offered secondary consideration actually results from something other than what is both claimed and *novel* in the claim, there is no nexus to the merits of the claimed invention." *In re Kao*, 639 F.3d 1057, 1068 (Fed. Cir. 2011). Establishing a nexus is a "fundamental requirement that must be met before secondary considerations can carry the day." *Id.*

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[162] Appeal No. 15-1648 JA05091-92 (Kambayashi at 91-92).

[163] JA06506-13 (Fox Reply Decl. ¶¶ 400-409); JA07107, 07110-11 (Croft Paper at 130 and 133-34).

In addition, "secondary considerations of nonobviousness . . . simply cannot overcome a strong prima facie case of obviousness." *Wyers v. Master Lock Co.*, 616 F.3d 1231, 1246 (Fed. Cir. 2010); *see also Leapfrog Enters., Inc. v. Fisher–Price, Inc.*, 485 F.3d 1157, 1162 (Fed. Cir. 2007). Thus, when the claimed invention "represent[s] no more than the predictable use of prior art elements according to their established functions, the secondary considerations are inadequate to establish nonobviousness as a matter of law." *Wyers*, 616 F.3d at 1246 (internal quotation marks and citation omitted).

Here, substantial evidence supports the Board's finding that SRA's evidence of secondary considerations was insufficient. SRA failed to establish a nexus between its proffered evidence of nonobviousness and the claimed invention, and in any event, SRA's evidence was too weak to overcome Petitioners' strong prima facie case of obviousness.

1. SRA failed to establish a nexus between its purported evidence of nonobviousness and the claimed invention.

In the proceedings before the Board, SRA presented what it considered to be evidence of nonobviousness, including commercial success, unexpected results, long felt need, failure of others, industry praise, and industry acquiescence.[164] In particular, SRA argued that Google's search engine is a commercial embodiment

[164] JA01301-04 (Patent Owner Response at 56-59); JA12451-53, 12458-68 (Langville Decl. ¶¶ 21-28, 43-65, 115-22); JA12362-79, 12403-09 (Jacobs Decl. ¶¶ 120-45, 176-84).

of the claimed invention, and that Google's commercial success—and all the industry praise that went along with it—is evidence that the claimed invention is not obvious.[165] The Board, however, correctly determined that SRA failed to establish a nexus between Google's commercial search product and the purportedly novel features of the '571 patent.[166]

Relying on the declaration of Dr. Amy Langville, SRA asserted that Google's "PageRank" algorithm practices the claimed invention.[167] But the record showed that Dr. Langville never compared the claimed invention to Google's commercial PageRank algorithm. Dr. Langville admitted in her deposition that she did not rely on the source code for Google's operational algorithm when she prepared her opinions.[168] Instead, she relied solely on an algorithm disclosed in U.S. Patent No. 6,258,999 and other public sources.[169] That publicly disclosed algorithm, however, is not the same algorithm Google uses in its commercial search engine, as Google has explained that "we developed much of our ranking

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[165] JA01301-04 (Patent Owner Response at 56-59).

[166] JA00023-25 (Final Written Dec. at 23-25).

[167] *See SRA* Br. at 57.

[168] JA06627, 6668-69 (Ex. 1033, Langville Depo. at 91, 132-33).

[169] JA06648 (Langville Depo. at 82).

technology after Google was formed" and that "***[m]ost of our current ranking technology is protected as trade secret***."[170]

Moreover, Dr. Langville failed to consider any other factors that may have contributed to the success of PageRank and Google. Evidence of secondary considerations is "relevant in the obviousness context only if there is proof that [the secondary considerations] were a direct result of the unique characteristics of the claimed invention," and not "factors unrelated to the quality of the patented subject matter." *In re Huang*, 100 F.3d 135, 140 (Fed. Cir. 1996). Although at least eleven patents have been issued concerning PageRank,[171] Dr. Langville admitted that she was unaware of all but two of them.[172] She also admitted that she made no effort to determine whether the success of Google's commercial search engine was the result of the inventions claimed in those other PageRank patents, or technology covered by the many other licenses that Google has taken to cover its systems.[173]

Because of these oversights, SRA failed to establish that Google's success was the direct result of the claimed invention, rather than some other factor (such as other patented inventions or Google's undisclosed trade secrets). As a result, it

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[170] JA11344 (Ex. 2055, at 10) (emphasis added).

[171] JA06138-JA06269 (Exs. 1021-31).

[172] JA06647, -6648, -6673 (Langville Depo. at 81, 82, 137).

[173] *Id.*

failed to establish the required nexus. *See Polaroid Corp. v. Eastman Kodak Co.*, 641 F. Supp. 828, 833 (D. Mass. 1985), *aff'd*, 789 F. 2d 1556 (Fed. Cir. 1986) (finding no nexus where the patent owner failed to show that the commercial success of a product was due to the patent-in-suit rather than another patent); *I/P Engine, Inc. v. AOL Inc.*, 576 F. App'x 982, 991 (Fed. Cir. 2014) (finding no nexus where the patent owner's expert agreed that the commercially successful technology "encompassed numerous features not covered by the asserted patents").

In addition, Dr. Langville ignored other purported commercial embodiments of the claimed invention that have not attained Google's success. "Evidence of secondary considerations must be reasonably commensurate with the scope of the claims." *Kao*, 639 F.3d at 1068. Here, SRA broadly defines the purportedly novel feature of the claimed invention as "analysis of link relationships of a computer database to enhance search."[174] But SRA's proffered evidence of nonobviousness concerns only one purported embodiment—Google's search engine—even though Dr. Langville's declaration states that, as of 1998, other companies—including Alta Vista and Excite!—had incorporated "link analysis" into their searches.[175] As is well known—and as Dr. Langville admitted in her deposition—these other

[174] Br. at 54; *see also id.* at 34, 57.

[175] JA12479-80 (Langville Decl. ¶¶ 83-84).

companies ultimately failed, [176] suggesting that Google's success was due to factors other than SRA's claimed invention. *See Huang*, 100 F.3d at 140.[177]

Ignoring these deficiencies, SRA chastises the Board for "erroneously conclud[ing] that the PageRank algorithm only applies to direct citations."[178] The Board, however, made no such conclusion. The Board noted only that the statements in Dr. Jacobs' declaration regarding PageRank were mainly lauding PageRank's use of direct citations, rather than indirect citations.[179] In doing so, the Board was not "limiting" PageRank to analysis of direct citations; rather, the Board was merely observing that PageRank's apparent success was attributed to a feature other than what is claimed to be novel in the '571 patent—namely, the analysis of *indirect* citations to search a computerized database.[180]

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[176] JA06692-94 (Langville Depo. at 156-58).

[177] The fact that Google has taken a license to the '571 patent is insufficient to establish a nexus—and particularly so because the license resulted from a litigation settlement. *See Iron Grip Barbell Co. v. USA Sports, Inc.*, 392 F.3d 1317, 1324 (Fed. Cir. 2004) (attributing "little weight" to a license because "it is often cheaper to take licenses than to defend infringement suits" (internal quotation marks and citation omitted)). SRA's reliance on *Rambus Inc. v. Rea*, 731 F.3d 1248 (Fed. Cir. 2013), for the contrary proposition is misplaced. In *Rambus*, unlike here, there was no evidence that the licenses at issue had resulted from a litigation settlement. *See id.* at 1257.

[178] Br. at 58-59, 60-62.

[179] *See* JA00024 (Final Written Dec. at 24).

[180] *See id.*

In sum, substantial evidence supported the Board's finding that SRA failed to show that its proffered secondary considerations were the direct result of the purportedly novel features of claims 12 and 22.[181]

2. The Board properly considered and rejected all of the secondary considerations that SRA proffered.

Without a sufficient showing of nexus, SRA's evidence of nonobviousness is entitled to little or no weight. *See GPAC*, 57 F.3d at 1580. Nonetheless, SRA faults the Board for supposedly failing to address, point-by-point, several purported secondary considerations.[182] This challenge fails as well.

The Board considered all the secondary considerations that SRA properly raised.[183] As to Google's unexpected results, commercial success, and industry praise, the Board concluded that SRA failed to show a nexus.[184] As to long-felt need and the failure of others, the Board concluded that the combined teachings of Fox Thesis, Fox SMART, and Fox Envision actually succeeded in teaching the supposedly missing innovation—namely, computerized searching of electronic

[181] JA00024 (Final Written Dec. at 24).

[182] Br. at 50-56.

[183] As an initial matter, SRA never argued to the Board that lack of actual use or industry skepticism was evidence of nonobviousness. *See* JA01300-04 (Patent Owner Resp. at 55-59). SRA may not raise such purported evidence for the first time on appeal. *Golden Bridge Tech., Inc. v. Nokia, Inc.*, 527 F.3d 1318, 1322-23 (Fed. Cir. 2008).

[184] JA00024 (Final Written Dec. at 24).

databases using web-based links.[185] And as to industry acquiescence, the Board concluded that Google's licensing of the '571 patent was entitled to little weight because it resulted from a litigation settlement.[186] In short, the Board considered and addressed all of the evidence properly presented to it.

More fundamentally, the Board not only considered the evidence presented to it, but also weighed it against the strong evidence of obviousness.[187] Given the strength of Petitioners' prima facie case of obviousness—especially Fox Envision's explicit suggestion to apply Fox Thesis and Fox SMART's methods to web-based links—the Board correctly concluded that SRA's secondary considerations were insufficient.[188] *See Wyers*, 616 F.3d at 1246 ("[S]econdary considerations of nonobviousness . . . simply cannot overcome a strong prima facie case of obviousness.").

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For the foregoing reasons, the Board correctly found that claims 12 and 22 of the '571 patent are unpatentable under § 103. The Court should therefore affirm the Board's decision with respect to those claims.

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[185] JA00023-24 (Final Written Dec. at 23-24).

[186] JA00024 (Final Written Dec. at 24).

[187] JA00024-25 (Final Written Dec. at 24-25).

[188] JA00024-25 (Final Written Dec. at 24-25).

CROSS-APPELLANTS' PRINCIPAL BRIEF

Facebook, LinkedIn, and Twitter cross-appeal from the Board's decision in IPR-481 finding that claim 21 of the '571 patent is not unpatentable as obvious over Fox Thesis, Fox SMART, and Fox Envision.

I. JURISDICTIONAL STATEMENT

The Board had subject-matter jurisdiction under 35 U.S.C. § 6(b)(4) to conduct *inter partes* review of the '571 Patent. This Court has exclusive subject-matter jurisdiction under 28 U.S.C. § 1295(a)(4)(A), 35 U.S.C. § 141(c), and 35 U.S.C. § 319 to hear this cross-appeal from the Board's final written decision.

On January 29, 2015, the Board issued its final written decision pursuant to 35 U.S.C. § 318(a), finding that Petitioners had not proven claim 21 of the '494 patent unpatentable.[189] Sixty-one days later, on March 31, 2015, Petitioners filed their notice of appeal with the Director of the United States Patent and Trademark Office pursuant to 35 U.S.C. § 142 and 37 C.F.R. 90.2(a)(1).[190] Petitioners also filed copies of their notice of appeal with the Board pursuant to 37 C.F.R. 90.2(a)(1), and served copies of the same on this Court pursuant to 37 C.F.R. 90.2(a)(2)(i) and Federal Circuit Rule 15(a)(1).[191] Petitioners' notice of appeal was

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[189] JA00002 (Final Written Dec. at 2).

[190] JA01482-85 (Our Notice of Appeal).

[191] JA01482-85 (NOA as filed on PRPS).

therefore timely under 35 U.S.C. § 142 and 37 C.F.R. 90.3(a)(1), which provides that the notice must be filed within sixty-three days of the Board's final written decision.

The Board's decision was final under 35 U.S.C. § 318(a) because it addressed the patentability of all the claims subject to *inter partes* review.[192] Accordingly, this cross-appeal is from a final order. *See* 35 U.S.C. § 141.

II. ARGUMENT

As explained above, the Board correctly found that the combination of Fox Thesis, Fox SMART, and Fox Envision teach all of the elements of claims 12 and 22 of the '571 patent. The Board, however, found that the prior art failed to teach a single limitation of claim 21: "deriving actual cluster links from the set of candidate cluster links based on the assigned weights."[193] The patent specification describes this step as routine:

> Once the candidate cluster link 2004 set has been generated, deriving the actual cluster links 2004 is a simple matter of selecting or choosing the T top rated candidate links 2004, and eliminating the rest.[194]

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[192] JA00036 (Final Written Dec. at 36).

[193] JA00025 (Final Written Dec. at 25).

[194] JA05959 (23:67-24:2).

In finding that the prior art failed to render it obvious, the Board erred in two ways: it failed to consider the cluster-splitting process taught by Fox SMART and Fox Thesis, and it misunderstood those references' cluster-tree-formation process.

A. The Board erred by failing to consider whether the cluster-splitting process disclosed in Fox SMART and Fox Thesis teaches the "deriving" step.

1. Cluster splitting unequivocally discloses the "deriving" step.

Fox SMART teaches that, when a cluster exceeds a pre-determined maximum size (e.g., 20 documents), the clustering algorithm splits the cluster and regroups the documents into smaller clusters.[195] Fox Thesis also describes this cluster-splitting process.[196]

To regroup the documents into smaller clusters, the algorithm calculates "pairwise similarity values" for every possible pair of documents.[197] In other words, if the oversized cluster contained 21 documents, the algorithm calculates the "similarity value" between Document 1 and Document 2, Document 1 and Document 3, Document 1 and Document 4, etc., all the way through Document 21; then calculates the "similarity value" between Document 2 and every other document; and so on, until it has calculated the "pairwise similarity value" for every possible pairing.

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[195] JA05958-62 (Fox SMART at 47-51).

[196] JA05734-35, 5740-42 (Fox Thesis at 193-94, 199-200).

[197] JA05940-43 (Fox SMART at 29-32).

Fox SMART teaches that these "similarity values" are calculated using subvectors that represent indirect citation relationships between the documents (*bc* and *cc*).[198] It further teaches that these indirect citation relationships are determined by first identifying direct citation relationships between the documents.[199] Thus, the cluster-splitting process identifies direct links between documents, determines indirect relationships based on those direct links, and then calculates pairwise similarity values for every possible pairing.[200]

These pairwise similarity values are non-semantic "candidate cluster links," as recited by claim 21. The Board construed "cluster links" as "relationships, which are represented in data stored in a computer and are used for grouping interrelated nodes."[201] The pairwise similarity values, calculated for the purpose of clustering, meet this definition. The Board construed "candidate cluster links" as "a set of possible cluster links between a search node and a target node."[202] The pairwise similarity values meet this definition as well, because they are a set of possible cluster links between every document and every other document. They are "non-semantically generated" because they are based on citation relationships

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[198] JA05940-43, 5957 (Fox SMART at 29-32, 46).

[199] JA05940-43 (Fox SMART at 29-32).

[200] JA05940-43 (Fox SMART at 29-32).

[201] JA00009 (Final Written Dec. at 9.)

[202] JA00006 (Final Written Dec. at 6).

(*bc* and *cc*).[203] They are between documents that are indirectly related—*i.e.*, related by *bc* and *cc*. And the amount calculated for each similarity value is the weight assigned to that candidate link. Thus, the pairwise similarity values are "candidate cluster links," exactly as claim 21 recites.

Indeed, the process described in Fox SMART is practically identical to the Egger patents' preferred embodiment, whose "cluster link generator" analyzes the direct links between a start node and destination nodes[204] and then, using those direct links, locates the indirect relationships or "paths" between the nodes.[205] Based on those direct and indirect links, the preferred algorithm generates a set of candidate cluster links.[206] Then, just like Fox SMART, the preferred embodiment's cluster link generator represents the candidate cluster links as vectors in a table or matrix.[207]

The next step of the Fox SMART cluster-splitting process also works like the preferred embodiment. The splitting operation identifies the most "highly correlated" pairs of documents in the cluster by "comparing the similarity of a pair to the average off diagonal similarity value and seeing if it is a sufficient number of

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[203] *See* JA00006 (Final Written Dec. at 6); JA01166 (Inst. Dec. at 9).

[204] JA05068, *id.*, 5069 (21:48-50, 21:53-56, 23:44-47, Fig. 3H).

[205] JA05068 (21:56-58, Fig. 3H).

[206] JA05068, 5069 (21:61-65, 23:61-64, 23:64-65, Fig. 3H).

[207] JA05068 (21:63-65); *see* JA05957 (Fox SMART at 46, Table 3) (describing a "complete similarity matrix").

standard deviations away from the mean."[208] Fox SMART then forms new, smaller clusters that have only "highly correlated pairs" and that pass other tests for similarity and overlap.[209] This, again, is no different from the preferred embodiment, which selects a subset of candidate cluster links to become "actual cluster links" based on their weight or strength.[210]

This process in Fox SMART teaches the "deriving" step of claim 21. The actual cluster links in Fox SMART are chosen "based on the assigned weights," as claim 21 recites, because the final clusters are defined by "highly correlated pairs"—i.e., pairs of documents with a high enough similarity value.[211] And the actual cluster links are, by definition, a subset of the candidate cluster links, because the candidate links (pairwise similarity values) are formed between *every* document and *every other* document that formed the oversized cluster, whereas the smaller clusters that are ultimately formed comprise a subset of those documents.

Thus, the cluster-splitting process unequivocally teaches the "deriving" step—"a simple matter of selecting or choosing the . . . top rated candidate links . . . and eliminating the rest."[212]

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[208] JA05961 (Fox SMART at 50).

[209] JA05961-62 (Fox SMART at 50-51).

[210] JA05068 (21:65-22:5, 22:58-61).

[211] JA05961-62 (Fox SMART at 50-51).

[212] JA05069 (23:67-24:2).

2. Petitioners identified the cluster-splitting process as disclosing the "deriving" step in the proceedings below.

Petitioners' original IPR petition pointed to the cluster-splitting process as disclosing the "deriving" step of claim 21.[213] Likewise, the Fox Declaration in support of that petition explained that Fox SMART's process of "recursively splitting overly large nodes" into "smaller clusters" teaches the "deriving" step."[214] Both the petition and the Fox Declaration explained that once clusters are split, new clusters are formed based on the "overall similarity"—including the strength of the indirect relationships—between documents.[215]

In addition, in response to SRA's questioning during cross-examination, Dr. Fox explained that "[w]hen you're splitting the node [or cluster], . . . you're going to look at the big cluster that we're trying to split and figure out where the two halves typically would go" and "what would be in each one of those."[216] To do this, he explained, the splitting operation "generate[s] . . . possible connections between" the documents—in other words, it "generat[es] lots of different candidate

[213] JA01021-22 (Pet. at 17-18) (citing Fox Decl. ¶ 162).

[214] JA05164-65 (Fox Decl. ¶ 162) (citing Fox SMART at 47-51).

[215] JA01022 (Pet. at 18) (citing Fox SMART at 46); JA05164-65 (Fox Decl. ¶ 162).

[216] JA10758-59 (Fox Depo. Tr. at 507:23-508:4).

cluster links" based on "similarity values."[217] Then, the process forms new clusters of "highly correlated pairs" of documents.[218]

Petitioners again identified the cluster-splitting as disclosing the "deriving" step in their reply brief, explaining that the clusters that are ultimately formed are those that meet certain criteria, including "having enough highly correlated pairs."[219] Dr. Fox explained the same thing in his Reply Declaration.[220]

Finally, Petitioners identified the cluster-splitting process as disclosing the "deriving" step at the oral hearing before the Board.[221] Petitioners explained that when the number of documents in a cluster exceeds a certain limit—usually twenty—a "complete similarity matrix is formed" by calculating the similarity between each document and every other document in the oversized cluster.[222] They further explained that each of those similarity values is a "candidate cluster link."[223] Petitioners then explained the next step of the splitting process, which is

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[217] JA10759, 10770 (Fox Depo. Tr. at 508:5-9, 519:8-15) (citing Fox SMART at 51, Fig. 21).

[218] JA10772 (Fox Depo. Tr. at 521:3-12, 521:21-25) (citing Fox SMART at 49-50).

[219] JA01360 (Reply at 7) (citing Fox SMART at 49-51).

[220] JA06460-62 (Fox Reply Decl. ¶ 317).

[221] JA15032-36 (Oral Tr. at 32:7-36:19).

[222] JA15032-34 (Oral Tr. at 32:8-33:3, 34:9-12).

[223] JA15033 (Oral Tr. at 33:4-9).

to form new, final clusters "based on high correlation values."[224] Those final clusters, Petitioners explained, are the "actual cluster links"—that is, a subset of links derived from the candidate cluster links.[225]

3. The Board erred by failing to consider cluster splitting.

Despite being presented with cluster-splitting as a disclosure of the "deriving" step, the Board failed to consider it in its Final Written Decision.[226] Instead, the Board focused on the "concentration" and "overlap" tests for forming clusters—which may be used in conjunction with splitting and reforming clusters, but are distinct from it—and construed them as part of the process of forming the cluster tree, not splitting oversized clusters into smaller ones.[227] Because, in the Board's view, the concentration and overlap tests do not actually delete clusters, the Board found that "Dr. Fox's testimony does not address persuasively the requirement in claim 21 of deriving a subset of the already generated candidate cluster links."[228]

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[224] JA15033-34 (Oral Tr. at 33:17-25, 34:13-19).

[225] JA15035 (Oral Tr. at 35:3-9).

[226] JA00025-28 (Final Written Dec. at 25-28).

[227] JA00027 (Final Written Dec. at 27) ("the concentration tests that are cited by Petitioner are performed as part of forming the cluster tree"); JA00028 (Final Written Dec. at 28) ("we find that one of ordinary skill in the art reasonably would have understood Fox SMART as teaching that the tests referred to by Dr. Fox are processed during formation of the tree." JA06444 (Fox Reply Decl. ¶ 281).

[228] JA00028 (Final Written Dec. at 28).

The Board erred in this analysis because it failed to consider whether the "pairwise similarity values" that are calculated when clusters are split and their members are regrouped into smaller clusters are "candidate cluster links" (which they are), or whether the actual clusters of "highly correlated pairs" that are ultimately formed comprise "actual cluster links" that are a subset of those "candidate cluster links" (which, by definition, they do)—as Petitioners contended.

Although "substantial evidence" is normally a deferential standard of review, the Board's decision should be reversed if it either fails to consider prior art or results from analytical or technical errors concerning the prior art. *See Smith & Nephew, Inc. v. Rea*, 721 F.3d 1371, 1378-80 (Fed. Cir. 2013). Petitioners respectfully submit that the Board's finding here did so, and that under a proper analysis, claim 21's "deriving" step was unequivocally disclosed in Dr. Fox's papers, and is not inventive. *See id.* at 1378, 1380 (holding that the Board's decision was not supported by substantial evidence where it was "the result of not reading the prior art for all that it teaches").

B. The Board made a technical error in concluding that the cluster-tree-formation process disclosed in Fox Thesis and Fox SMART fails to teach the "deriving" step of claim 21.

Besides failing to consider cluster splitting, the Board misunderstood the cluster-tree-formation process disclosed in Fox Thesis and Fox SMART. This, too, was error.

1. The cluster-tree-formation process disclosed in Fox Thesis and Fox SMART teaches the "deriving" step.

In Fox SMART, cluster tree formation begins by generating submatrices to represent the bibliographic relationships between documents in the database.[229] An algorithm analyzes "which documents are cited by others"—also known as direct links ("*ln*")—and then uses that citation information to locate indirect relationships like *bc* and *cc*.[230] The algorithm then represents the direct and indirect relationships between documents as subvectors in submatrices.[231] These subvectors represent the "candidate cluster links"—they show how each document is linked to every other document in the database.[232] The clustering process in Fox Thesis is the same as in Fox SMART.[233] It determines the direct and indirect links between documents in a database, and then builds subvectors to represent the values of those linkages.[234]

Again, this initial step of cluster tree formation is no different than the preferred embodiment of the '571 patent. The preferred "cluster link generator"

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[229] JA05940 (Fox SMART at 29).

[230] JA05940-42 (Fox SMART at 29-31).

[231] JA05941-43 (Fox SMART at 30-32).

[232] *See* JA05064 (13:32-33) (defining "cluster link" as any "relationship between two nodes").

[233] *See* JA05952-55 (Fox SMART at 41-44

[234] JA05705-18, 5734-35 (Fox Thesis at 164-77, 193-94, Table 7.1).

analyzes the direct links between a start node and destination nodes[235] and then, using those direct links, locates the indirect relationships or "paths" between the nodes.[236] Based on those direct and indirect links, the preferred algorithm generates a set of candidate cluster links.[237] In fact, just like Fox SMART, the preferred embodiment's cluster link generator represents the candidate cluster links as vectors in a table or matrix.[238]

The next step of the Fox papers' cluster-tree formation process is also identical to the preferred embodiment. The Fox SMART clustering algorithm "proceeds by adding documents one by one" to the cluster tree in order to produce "a hierarchy where *N* documents in a collection end up as leaves of a multilevel tree."[239] Adding each document to the cluster tree "involves a search for the proper place to insert the new document."[240] To search for the proper cluster for each document, the algorithm uses the *ln*, *bc*, and *cc* subvectors—that is, the candidate cluster links that have already been generated—to compute the "overall similarity" between the document being added and each of the *N* documents in the

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[235] JA05968, 5069, 5083, 5010 (21:53-56, 23:44-47, 49:12-56, Fig. 3H).

[236] JA05968, 5082, 5010 (21:56-61, 49:40-47, Fig. 3H).

[237] JA5068, 5069, 5082 (21:61-65, 23:61-65, 49:47-53, Fig. 3H).

[238] JA05068 (21:61-65); *see* JA05957 (Fox SMART at 46, Table 3) (describing a "complete similarity matrix").

[239] JA05955 (Fox SMART at 44).

[240] JA05955 (Fox SMART at 44).

tree.[241] The algorithm ultimately adds the document to the cluster containing the documents that are most similar to it based on those direct and indirect relationships.[242] Fox Thesis disclosed the same clustering process.[243]

The preferred embodiment of the '571 patent works precisely the same way as Fox SMART and Fox Thesis—once the algorithm has generated all of the candidate cluster links between the start node and all the *N* destination nodes, it simply chooses a subset of the *N* links that are strongest.[244]

Thus, both the preferred embodiment and Fox SMART's clustering tree generate a set of candidate cluster links and then derive a subset of actual cluster links, as claimed in the '571 patent. They both "choos[e]" a node for analysis and "identify[]" direct and indirect links.[245] They both then "generat[e] a set of candidate cluster links for nodes indirectly related to the chosen node."[246] Finally, they both accomplish the "simple matter" of "deriving actual cluster links from the set of candidate cluster links" by selecting a subset of links based on the weight or strength of the links.[247]

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[241] JA-5957 (Fox SMART at 46)

[242] JA05957 (Fox SMART at 46).

[243] JA05734-35, 5754-55 (Fox Thesis at 193-94, 213-14).

[244] JA05068, 5069, 5082 (21:65-22:5, 22:42-43, 22:58-61, 23:66-24:2, 49:57-50:1).

[245] *See* JA05058 (2:38-55).

[246] *See* JA05058 (2:38-55).

[247] *See* JA05058 (2:38-55).

2. Petitioners presented the cluster-tree formation process as invalidating prior art to the Board.

Petitioners directed the Board to the clustering process in Fox Thesis and Fox SMART—including cluster-tree formation—as teaching the "generating" and "deriving" steps of claim 21 in their initial petition.[248] In addition, on cross-examination, Dr. Fox explained in depth how the cluster tree process discloses these claim elements.[249]

Dr. Fox explained first that the Fox SMART clustering algorithm generates candidate cluster links by building the *ln*, *bc*, and *cc* subvectors.[250] In a database with several thousand articles, he explained, each article could have many direct and indirect links to many other articles.[251] Each of these links is a candidate cluster link.[252] By calculating the *ln*, *bc*, and *cc* subvectors and entering them into a submatrix, the clustering algorithm generates the candidate cluster links.[253]

For each document in a typical database, Dr. Fox continued, there are too many candidate cluster links to be useful for a search.[254] The algorithm therefore

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[248] JA01019, 1021-22 (Pet. at 15, 17-18) (citing Fox Thesis at 193-94, 199-200, 213-14; Fox SMART at 47-51); *see also* JA05163-65 (Fox Decl. ¶¶ 160-62).

[249] JA10710, 10734-48, 10753-55 (Fox Depo. at 459:7-475:5, 483:15-497:18, 502:12-504:17).

[250] JA10712 (Fox Depo. at 461:9-14).

[251] JA10712 (Fox Depo. at 461:22-462:19).

[252] JA10712, 10714, 10745-46, 10748 (Fox Depo. at 461:9-13, 463:2-4, 494:19-495:6, 497:13-16) (citing Fox SMART at 30-32).

[253] JA10746 (Fox Depo. at 495:1-6).

[254] JA10713 (Fox Depo. at 462:7-19).

creates clusters of documents that are the most closely related to each other based on the available subvectors, such as bibliographic coupling and co-citation.[255] Thus, for each document, the algorithm chooses which "place" (that is, cluster) in the tree the document should go based on its direct and indirect connections to other documents.[256] Dr. Fox explained that this process of taking the set of all candidate cluster links for a given document and choosing a smaller subset of those links to create final clusters is the same as "deriving" actual cluster links from candidates.[257] Dr. Fox summarized the process by explaining that for each document in the database, the algorithm considers all its bibliographic connections to come up with "potential places it could go" in the tree.[258] From these candidates, Dr. Fox explained, the algorithm chooses a set of links to create the final, actual cluster.[259]

Dr. Fox even drew a picture to illustrate how forming the cluster tree derives actual cluster links from candidate cluster links.[260] First, he drew a matrix to represent the bibliographic relationships—specifically, the co-citation

[255] JA10713 (Fox Depo. at 462:19-463:1)

[256] JA10713-14, 10715, 10716 (Fox Depo. at 462:21-463:1, 464:6-11, 465:9-15).

[257] JA10714, 10715, 10746-48, 10753 (Fox Depo. at 463:2-7, 464:9-11, 495:16-497:18, 502:12-21) (citing Fox SMART at 44-54).

[258] JA10755 (Fox Depo. at 504:12-17) (citing Fox SMART at 47, Figure 15).

[259] JA10755 (Fox Depo. at 504:18-22) (citing Fox SMART at 47, Figure 15).

[260] JA10211 (Exhibit 2013); JA10718-26, 10734-38 (Fox Depo. at 467:10-475:5, 483:15-487:19).

relationships—among documents in a hypothetical database.[261] He also drew a graph to further represent the connections shown in the matrix.[262] Next, he labeled the connections with weights, and explained that the connections are candidate cluster links.[263] He then labeled the matrix and graph with a "G," which stood for "generating."[264] Finally, he drew two final clusters, with cluster 1 containing documents 1 and 2 and cluster 2 containing documents 3 and 4.[265] He explained that the links between the documents in the final clusters were actual cluster links, and he marked them as such with the label "A."[266]

In addition to the petition and Dr. Fox's testimony, Petitioners presented cluster-tree formation as prior art in both their Reply and in Dr. Fox's Reply Declaration.[267] Finally, Petitioners explained at the oral hearing that there are several ways in which Fox SMART teaches "generating" candidate cluster links

[261] JA10211 (Exhibit 2013); JA10719 (Fox Depo. at 468:5-24).

[262] JA10211 (Exhibit 2013); JA10719-20 (Fox Depo. at 468:25-469:3).

[263] JA10211 (Exhibit 2013); JA10720 (Fox Depo. at 469:3-17).

[264] JA10211 (Exhibit 2013); JA10735 (Fox Depo. at 484:14-18).

[265] JA10211 (Exhibit 2013); JA10720-21 (Fox Depo. at 469:22-470:13).

[266] JA10211 (Exhibit 2013); JA10721, 10735-36 (Fox Depo. at 470:9-13, 484:19-485:9).

[267] JA01359-60 (Reply at 6-7); JA06460-62 (Fox Reply Decl. ¶ 317).

and "deriving" actual cluster links, and that one of those methods is the formation of the cluster tree.[268]

3. The Board misunderstood the sequence of cluster tree formation.

The Board's conclusion that the Fox Papers do not teach the "deriving" step resulted from a fundamental misunderstanding about the way cluster-tree formation works. In particular, the Board made a technical error at the outset of its analysis by misidentifying which step of the cluster-tree process generates candidate cluster links. This technical error infected the remainder of the Board's decision, causing it to draw incorrect conclusions about the "deriving" step.

In its analysis of claim 21, the Board stated that "a tree resulting from the clustering algorithm, which includes 'all' the documents in the collection[,] teaches the claimed set of generated candidate cluster links."[269] This misconstrued Petitioners' contention, which was that the "candidate cluster links" are the *ln*, *bc*, and *cc* subvectors—not the final clusters in the cluster tree.[270] By misidentifying the cluster tree as the set of candidate cluster links—rather than the set of actual cluster links—the Board skipped a step of the Fox papers' clustering process. In Fox SMART, candidate cluster links are generated *before* the multilevel tree is

[268] JA15032, 15034 (Oral Tr. at 32:2-6, 34:4-7).

[269] JA0025-26 (Final Written Dec. at 25-26) (citing Fox Decl. ¶ 160).

[270] JA10712, 10714, 10720, 10745-46, 10748 (Fox Depo. at 461:9-13, 463:2-4, 469:3-17, 494:19-495:6, 497:13-16) (citing Fox SMART at 30-32); JA10211 (Exhibit 2013); *see supra* subsection 2.

constructed.[271] Only after the clustering algorithm has generated the candidate cluster links—that is, by calculating similarity based on the *ln*, *bc*, and *cc* subvectors—does the algorithm build the multilevel tree.[272] At that point, each document is added to whichever cluster contains the most closely related documents, making that particular cluster the set of actual cluster links for that particular document.[273]

Because the Board mistook the cluster tree for the candidate cluster links, it failed to see how the cluster-tree formation process derives actual cluster links that are a subset of the candidates. Instead, it focused on a separate process in Fox SMART: the "uncour" test.[274] This test comes into play only after overly large clusters are split apart, which in turn happens only after the cluster tree is formed.[275] In essence, uncour is a clean-up operation that ensures that newly reformed, post-split clusters do not overlap.[276] If there is too much overlap, uncour

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[271] JA10720-21, 10735-36, 10755 (Fox Depo. at 469:22-470:13, 484:19-485:9, 504:12-17) (citing Fox SMART at 47, Figure 15).

[272] *Id.*

[273] JA10714, 10715, 10720-21, 10735-36, 10746-48, 10753, 10755 (Fox Depo. at 463:2-7, 464:9-11, 469:22-470:13, 484:19-485:9, 495:16-497:18, 502:12-21, 504:12-22) (citing Fox SMART at 44-54, Figure 15); JA10211 (Exhibit 2013).

[274] JA00026 (Final Written Dec. at 26).

[275] JA05960-62 (Fox SMART at 49-51); *see supra* Section A.1.

[276] JA05951-62 (Fox SMART at 40-51); JA05164-65 (Fox Decl. ¶ 162).

deletes the overlapping clusters, sending their documents either to new clusters or to an "orphan" cluster.[277]

Because the Board viewed the final cluster tree as the set of candidate cluster links, it focused on whether uncour "deletes" clusters from the tree to derive a subset of clusters.[278] The Board then faulted Fox SMART for not disclosing "deleting clusters other than those that overlap," and for not deleting documents that end up in "orphan" clusters.[279] But whether clusters or documents are deleted at that stage is irrelevant, because the actual cluster links (the clusters in the tree) have already been derived from, and are thus a subset of, the candidate cluster links (the similarity values based on the *ln*, *bc*, and *cc* subvectors calculated for every document in the database).[280]

In short, because the Board misunderstood or overlooked how Fox SMART generates candidate cluster links, it focused on an irrelevant question, which in turn led it to conclude incorrectly that Fox Thesis and Fox SMART do not disclose the "simple" step of "deriving" actual links from candidates.[281]

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[277] JA05961 (Fox SMART at 50).

[278] JA00026-28 (Final Written Dec. at 26-28).

[279] JA00027-28 (Final Written Dec. at 27-28).

[280] *See supra* Section B.1.

[281] JA05069 ('571 patent at 23:67-24:2).

4. The Board's technical error merits reversal.

In *Smith & Nephew*, this Court concluded that the Board's decision lacked substantial evidence because it resulted from a misunderstanding about how the prior art worked. *See* 721 F.3d at 1378-80. This Court should conclude the same here. The Board's technical error led it to incorrectly conclude that Fox Thesis and Fox SMART do not teach the straightforward step of deriving actual cluster links from candidates. This error provides a separate and independent reason to reverse the Board's decision with respect to claim 21.

CONCLUSION

For the foregoing reasons, the Court should affirm the Board's decision with respect to claims 12 and 22 of the '571 patent, and reverse the Board's decision with respect to claim 21 of the'571 patent. As to that claim, the Court should hold that it, too, is obvious.

Respectfully submitted,

DATED: September 25, 2015

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CERTIFICATE OF SERVICE

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